

DESIGN AND FABRICATION OF GO-KART CHASSIS

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ABSTRACT

This thesis deals with the design and fabrication of go-kart chassis. The objective of this thesis is to design and fabricate a go-kart chassis of an electric go kart. The main problem is the cost for current go-kart chassis is too expensive so the project is decide to fabricate with a lower cost. The scopes identified chassis design should bear load of 150kg and the go-kart chassis must with floor dimension of chassis is 1400mmx830mm. There are many steps taken to design and fabricate this chassis. The first stage is did some literature review about the existing go-kart and go-kart chassis. Mostly current model of go-kart chassis is made from tubular pipe. Hence, this project is to modify the current model of go-kart chassis into a model that is easier to design, build and modify. Follow up with some designing and sketching. During this phase, three designs had been sketch to be as the design concepts. The structural three-dimensional solid modelling of go-kart chassis was developed by using Solid Works engineering drawing software. As for each design have their advantages and disadvantages. After done with design and sketch, conceptual process is done and design 3 has been chosen because this design is more advantageous than other two designs. Design 3 is lightweight and easier to design, build and modify. Some modification is done on design 3 where, the go-kart chassis is more space saving and the design has provided protection to the users to prevent the user from fall during drive the go-kart. Next stage after finalize the design, the project is continued with fabrication process. The fabrication process also undergoes many steps such as material marking, cutting, drilling, welding, grinding and finalizing the go-kart chassis by painting to make a go-kart chassis more interested. Thus, by finishing this project, the objective of the project is achieved. Finally, the conclusion about this project and the recommendations for the future plan also attached together with this thesis.

ABSTRAK

Tesis ini membentangkan perkembangan mereka bentuk dan menghasilkan rangka badan go-kart. Objektif tesis ini ialah mereka bentuk dan menghasilkan rangka badan go-kart untuk go-kart elektrik. Masalah utama yang dihadapi adalah kos go-kart semasa adalah terlalu mahal dan dengan projek ini ia dapat memutuskan untuk menghasilkan reka bentuk kos yang lebih rendah. . Projek ini perlu merangkumi skop-skop berikut, reka bentuk rangka badan go-kart dapat menampung beban 150kg dan rangka badan go-kart mesti berlandaskan dimensi lantai rangka badan 1400mmx830mm. Terdapat beberapa langkah-langkah yang telah diambil untuk mereka bentuk dan menghasilkan rangka badan go-kart. Peringkat pertama adalah melakukan beberapa kajian mengenai go-kart sedia ada dan rangka badan go-kart. Kebanyakan model semasa rangka badan go-kart diperbuat daripada paip tiub. Oleh itu, projek ini adalah untuk mengubah suai model semasa rangka badan go-kart ke dalam bentuk model yang lebih mudah untuk mereka bentuk, membina dan mengubah suai. Sesulan dengan beberapa bentuk dan lakaran. Semasa fasa ini, tiga reka bentuk telah dilakarkn untuk menjadi sebagai konsep reka bentuk. Lukisan struktur tiga dimensi bentuk rangka badan go-kart ini telah direka dengan menggunakan peisian lukisan kejuruteraan yang dinamakan "*Solid Works*". Setiap rekaan mempunyai kelebihan dan kekurangan masing-masing. Selesai dengan fasa mereka dan melakar rekaan ini iaitu rekaan ini lebih ringan dan rekaan ini lebih mudah untuk mereka bentuk, membina, dan mengubah suai berbanding dua reka bentuk yang lain. Sedikit pengubahsuaian dilakukan ke atas rekaan 3, rangka badan go-kart lebih jimat dari segi ruang dan reka bentuk mempunyai keselamatan kepada pengguna untuk mengelakkan pengguna terjatuh ketika memandu go-kart. Selepas menghasilkan lakaran reka bentuk langkah seterusnya diteruskan dengan proses penghasilan. Proses penghasilan ini telah menjalani banyak proses tertentu seperti mengukur, menanda, memotong bahan mentah, membuat lubang, mencantum bahagian-bahagian tertentu, mengikir bahagian-bahagian yang terlebih semasa dicantumkan dan akhirnya mencatkan rangka badan go-kart supaya lebih menarik. Dengan menyiapkan projek ini, objektif projek ini tercapai. Akhir sekali, terdapat juga kesimpulan mengenai projek ini dan perkara-perkara yang boleh diperbaiki dalam projek ini di masa hadapan dalam tesis ini.

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LIST OF SYMBOLS

| | |
|----|------------|
| kg | Kilogram |
| mm | Millimeter |
| m | Meter |
| % | Percent |
| + | Positive |
| - | Negative |
| N | Newton |
| Ø | Diameter |

LIST OF ABBREVIATIONS

| | |
|------|----------------------------|
| HSS | High-Strength Steel |
| SMAW | Shielded Metal Arc Welding |
| UMP | Universiti Malaysia Pahang |

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CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter it will explains about the project background, project objective, project scope and the project flow that been conducted. Besides that, it also consists of flow chart and Gantt chart of the project which explains the overall procedure and how time is being distributed for this project.

1.1 Project Background

Go-kart or karting was born from United States in 1950s, where the engine mainly from discarded lawn engine. Go-kart is a driving and racing miniature, skeleton frame, and rear engine automobiles called karts (DiNozzi. B, 1999). Go-kart is a non popular sport previously, but today it has become one of the most popular sports by multiple group age. Now days, racing go-karts are considered as one of the most economic activity where a large number of people can participate. We regularly hear about motorsports racing such as formula one, NASCAR, rally art and many more. Those motorsport activities are out of reach of the average people because of strict regulations and high cost. But apparently, go-kart motorsport gives chances to public to get involved in legal racing with no restricted age and low budget needed. Seven times formula one World Champion; Michael Schumacher started his involvement in motorsports with karting. He joined go-kart motorsports at his hometown, Germany and won first go-kart championship when he was 19 years old (McCauley. J, 2008). All go-karts look alike, but the fact is go-kart have its own classes such as sprint kart, road racing kart, indoor karting and speedway karting. In

addition, with small engine and skeleton frame go-karts speed can reach up to 100 miles per hours and stand a weight up to 210 pounds. In figure 1.1 and figure 1.2 show the different between old version go-kart and now day go-kart.

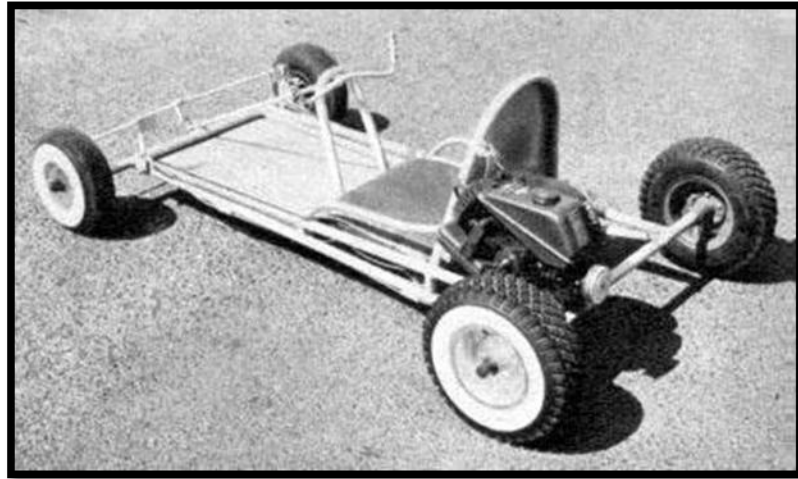


Figure 1.1: Old Version Go-kart

(www.rc-trucks.org)

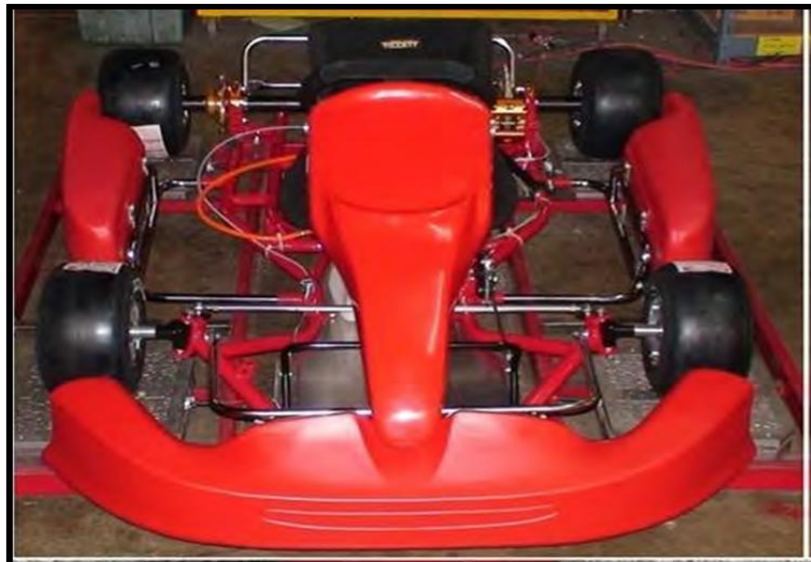


Figure 1.2: Go-kart

(www.tornadoDriver.com)

The development in karting has expanded rapidly together with advanced technology. As this motorsport become popular among citizens, those go-karts manufactures started to do more research and development to improve the go-kart in terms of the chassis design, speed, braking system and transmission system. Today is go-kart frames are made from lighter iron, chromoly and others which is more durable and it can absorb more vibration even if it has no suspension. Designers, engineers and others have involved directly towards new achievement in improving all aspects in the go-kart. The usage of advance technology in manufacturing is widely utilized to invent a better go-kart.

1.2 Problem Statement

The problem statement of this project is:

- (i) To improve the skill and knowledge of Mechanical engineering student in designing and importance of project developing go-kart.
- (ii) The cost for current go-kart chassis is too expensive.

1.3 Objective

The objectives of the project are as follow:

- (i) To design a go-kart chassis.
- (ii) To fabricate a go-kart chassis.

1.4 Scope of Project

The scopes of project are as follow:

- (i) Create conceptual design by using solid works.
- (ii) Chassis design should bear load of 150kg.
- (iii) The go-kart chassis with floor dimension of chassis is 1400mmx830mm.

1.5 Project Planning

Figure 1.3 is the flow chart of the whole Final Year Project. To start this project, an appointment with the supervisor is done to understand about the project title given and manage the schedule of weekly meeting. The meeting with supervisor was set up on Wednesday every week.

Problems are then indentified and objective and scopes of the project is then fixed. Designing phase starts off by sketching few designs and models of go-kart chassis by using manual sketch on A4 papers. Then, analyses the designs and choose an appropriate design to finalize. Next, propose the design to the supervisor. After that, convert the design to the three dimensional drawing using Solid Works software.

The preparation of mid-presentation of the project is next. Before presenting, the supervisor will see through the presentation slides and comment on corrections to be made. Then, the presentation on the knowledge attained and instilled in the design phase is presented to the three panels of judges.

Following up, is the survey for the materials is needed. The modification is done on the design so as the model chassis will operate better. Once receive the materials, start the fabrication of the go-kart chassis. Fabrication starts with the measuring of the materials and follow up by cutting of the materials, welding the parts together, grinding to get finishing the project and lastly painting the go-kart chassis.

After that, the final report writing and presentation will be the last task to be accomplished before semester break. The supervisor will review the final presentation and revise the mistakes to be amended. The final presentation then again will be presented to three panels. A draft report would then be submitted to the supervisor to be point out the flaws. Corrections are done and the real final report is handed over as completion of the final year project.

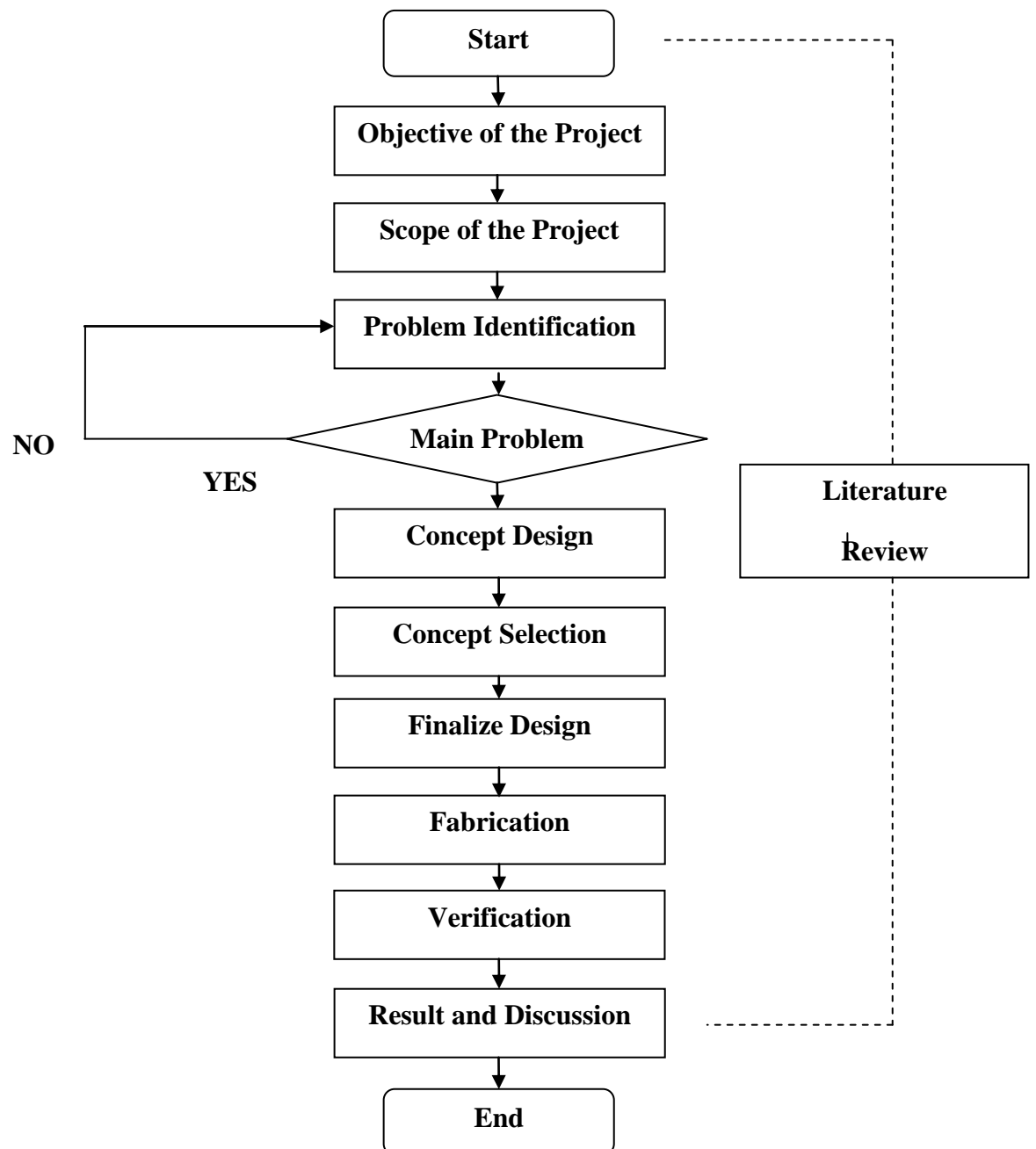


Figure 1.3: Project Flow Chart

Gantt chart of this project is shown in figure 1.4. Gantt chart would show the planning and the actual progress of the final project. It will show the difference between the planning of the project and the actual progress of it thus allowing a comparison to be made between two.

As shown in the Gantt chart, the time used for concept design was longer than expected. This was because of the incompatibility of the laptop to design the chassis. The laptop could not afford to install the suggested, Catia and the design process has to be done using Solid Works. Besides that, the go-kart chassis dimension must fixed with other team members tasks so it took a longer time to create a new concept that can be fixed with other member teams.

The time used for literature review was also shorter. This was because more focus has to be given to conceptual design and fabrication process that were delayed due to causes that cannot be prevented.

The fabrication of the go-kart chassis also took longer time than expected because of the limited choices of material that faculty has. The fabrication process of the go-kart chassis also took a longer time because the facilities provided at the workshop is not enough to be done at the appointed time for example cutting machine problems and anything that the problems that can contribute to this factor.

Other than that, the preparation for final report also started late. It was due to uncertainties that are caused by the delay of the fabrication process. This is because the presentation of most of the chapters for the final report has to base on the fabricated product.

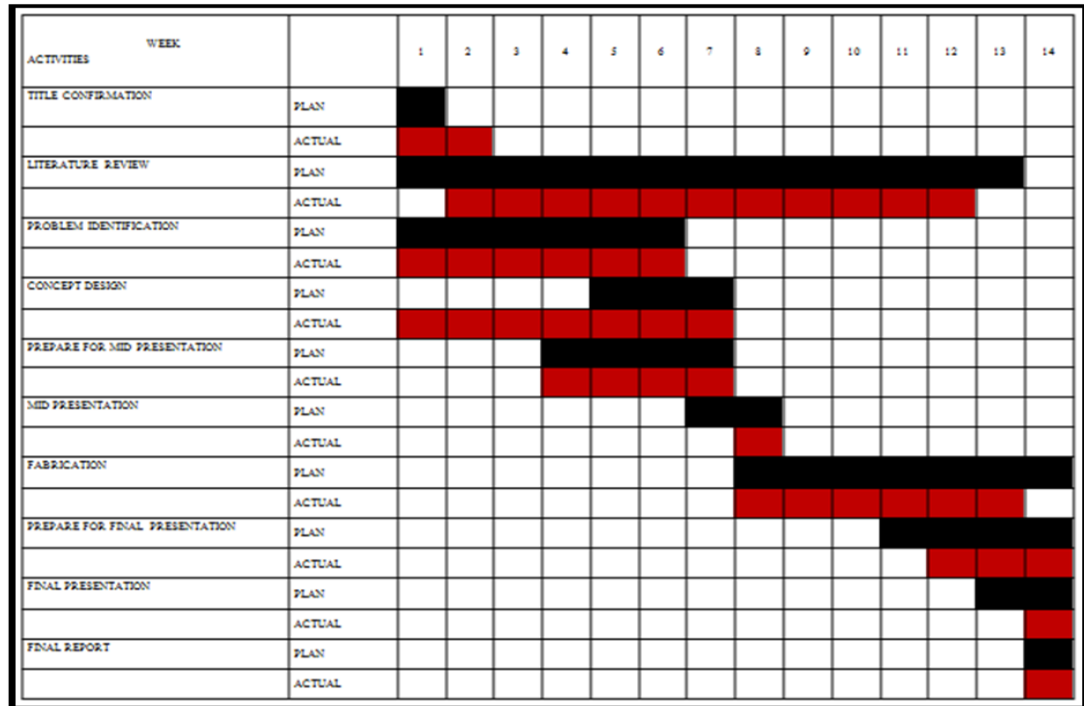


Figure 1.4: Gant Chart

1.6 Thesis Outline

In Chapter 1 it would explain about problem identifications, objectives, scopes, flow chart and Gantt chart. In this chapter also contain planned the direction of my final year project.

In Chapter 2 it will go through the literature review of the go-kart chassis. This chapter will discuss about reviewing study about the Go-kart chassis and the theory about chassis.

In Chapter 3 it will explain about the Design Concept and Selection of the project. This chapter will discuss more about the concept that I have come out with and the selection of project to fabricate the go-kart chassis.

In Chapter 4 would go through the fabrication process of the selected design, the tools and machine that were used for fabrication would also be discussed.

In Chapter 5 would then go detail on the final product that has been fabricate. The fabricated product would explain the go-kart chassis and it would also be shown. The result and discussion of the project would also be done in this chapter.

In Chapter 6 it contains the conclusion about the project. This chapter would conclude the project and give some recommendation on future similar projects.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In this chapter explains about literature review would be done, which include the theory about go-kart chassis. Usually a go-kart or owner who wants to improve the handling of the vehicle will purchase the latest in wheels, tires and other optional equipment, but end up finding that those things in fact handles worse. The first stage in achieving a good handling kart that will provide the greatest percentage of power efficiency is to go right back to basics.

The chassis is the framework of any vehicle. The suspension, steering, and drive train components such as engine, transmission, and final drive components are mounted to the chassis. The chassis would have to be strong and rigid platform to support the suspension components (James D. Halderman). Furthermore, the constructions of today are vehicles require the use of many different materials. Chassis of go-kart is not much different from normal car chassis; in fact it is much less complicated. The different in size and weight make go-kart chassis much easier to design and construct.

2.1 Chassis Design

A typical dictionary definition of chassis usually includes terms such as framework on which body or working parts of a vehicle, radio or television are built. There are three basic design used today: frame, unit body, and space frame construction.

2.1.1 Frame Construction

The frame construction usually consists of channel-shaped steel beams welded and fastened together. The frame (chassis) of vehicle will supports all the running gear mounted on it, it also including the engine, transmission, rear axle assembly (if rear wheel drive), and all the suspension components.

The type of frame construction that is referred to as full frame, is so complete that most karts can usually be driven without the body. Terms and label of different kind of frame are as follows:

i. Ladder Frame

This type of frame is common for the type of perimeter frame where the transversely (lateral) connected members are straight across. Figure 2.1 shown as ladder frame sample where viewed with the body removed. The frame resembled a ladder viewed from top.

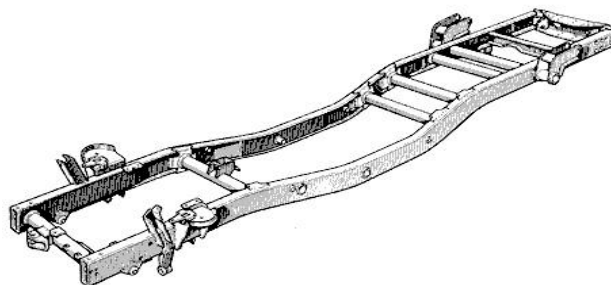


Figure 2.1: Ladder frame of common vehicle.

(Source from *Automotive Chassis System*)

ii. Perimeter Frame

This type of frame consists of welded or riveted frame members around the entire perimeter of the body as shown in Figure 2.2. The frame members will provide support underneath the sides as well as for the suspension and suspension components.

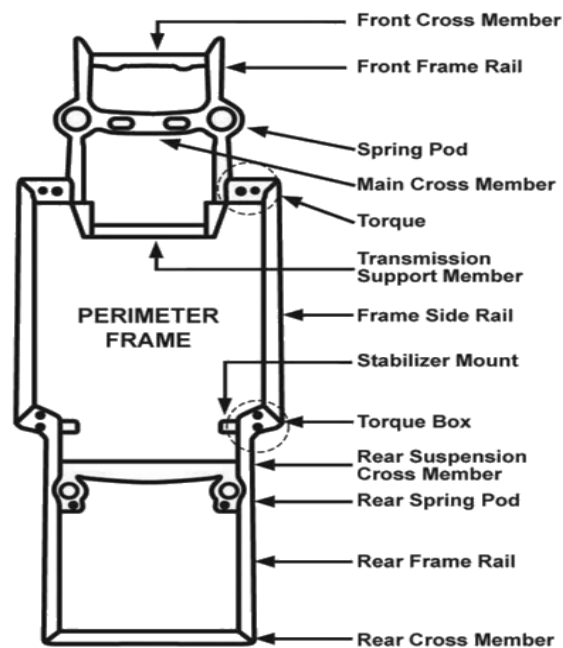


Figure 2.2: Perimeter frame of common vehicle.

(Source from *Automotive Chassis System*)

iii. Stub-Type Frame

Stub-type frame shown in Figure 2.3 is a partial frame often used on unit-body vehicle, a type of vehicle construction, first used by the Budd Company of Troy, Michigan, that does not use a separate frame. The body is built strong enough to support the engine and the power train, as well as the suspension and steering system. The outside body panels are part of the structure to support the power train and suspension components. It is also called cradle.

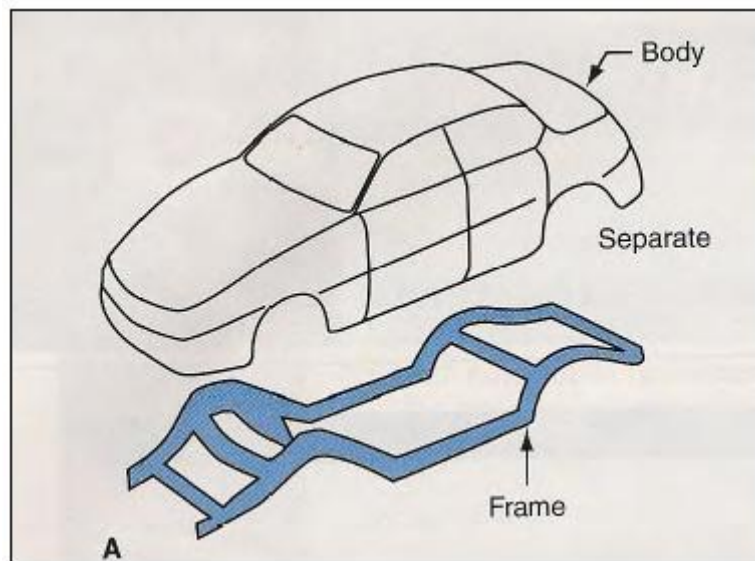


Figure 2.3: Stub-Type Frame of common vehicle.

2.1.2 Unit-Body Construction

The Unit-Body Construction is sometimes referred as unibody that is designed in such a way that the body is combined with the structure of the frame. The body itself also supports the engine and driveline components, as well as the suspension and steering components. The body is composed of many individual stamped steel panels welded together.

The strength of this type of construction lies in the shape of the assembly. The arrangement of parts to be joined or formed not only provides sufficient strength to withstand high stress but also the stability of the vehicle during any performances. The typical vehicle uses 300 separate and different stamped steel panels that are spot-welded to form a vehicle's body.